

Highlights

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Washington SCIENCE TRENDS

SPACE BOOSTER SYSTEMS

Here is an up-to-the-minute rundown on advanced space booster systems planned by the National Aeronautics and Space Administration for future satellite, space probe and lunar missions. The systems are listed in order of their expected availability:

* Thor-Hustler - a combination of the Thor IRBM and the Hustler engine originally developed for the B-58 bomber program. To be used in the Discoverer satellite program shortly.

* Atlas-Able - a combination of the Atlas ICBM and second and third stages adapted from the Able program, which used modified Vanguard staging.

* Atlas-Hustler - a modified ICBM in combination with the Hustler staging.

* Scout - a New rocket expected to be capable of placing 150 pound payloads in a 300 mile orbit at one-fifth the cost of other systems. Being developed by NASA at the Langley (Va.) Research Center with solid rockets from the Jet Propulsion Laboratory, the Allegany Ballistics Laboratory plus a solid-fuel Jupiter Senior.

* Centaur - a high payload booster being developed with a modified Atlas first stage, a second stage using lox-hydrogen fuel and a third stage using storable propellants from the Jet Propulsion Laboratory.

* Vega - a smaller rocket using a Centaur-type first and third stage, but with a lox-kerosene powered modified Vanguard booster as a second stage.

* Million Pound Cluster - a first stage using the cluster being developed by the Army Ballistic Missile Agency, a modified Titan I using lox-kerosene as a second stage, a lox-hydrogen third stage and a storable propellant fourth stage.

* Six Million Pound Cluster - a cluster of million pound engines as a first stage will be topped by a second stage clustering two such engines. Third and fourth stages will use lox-hydrogen, and a fifth stage will use the new storable propellants.

(Pictures of the new booster systems and information on payload capabilities are included as a special supplement to this week's report.)

WEATHER MODIFICATION RESEARCH:

National Science Foundation expects to finance about \$1.4 million in weather modification studies this Fiscal Year and is arranging for a series of "workshop" conferences to stimulate effort in this field.

Programs--Robert B. Brode, Associate Director of the Foundation has reported to Congress that there have been 20 proposals for research support submitted to date, with a total budget request for over \$3 million. Screening of these proposals has led to these planned expenditures: Laboratory studies, \$400,000; experimental field projects, \$810,000; physical and statistical evaluation, \$150,000; and conferences, \$40,000. The Foundation has requested an additional \$2 million in funds for the Fiscal Year which begins next July 1.

Conferences--First of three "workshop" conferences will be conducted this month by the American Meteorological Society and the Foundation for Instrumentation Education and Research. Up for discussion will be the problem of improved measurement and instrumentation for cloud physics and weather modification.

The National Academy of Sciences is planning an April 1959 meeting which will bring together mathematicians, statisticians and cloud physicists to exchange ideas on the design and evaluation of field test experiments.

American Geophysical Union is arranging a later meeting which will call meteorologists, physicists and chemists together to discuss theoretical and experimental research regarding the scientific basis of weather modification.

Program officials say they have "established direct contact with all known private weather engineers and consulting groups" in the country, particularly for their advice in the preparation of information forms which they will use in reporting all cloud seeding operations to the Foundation.

SHOCK VIBRATION SYMPOSIUM: Army will play host to the Shock and Vibration Symposium at Ft. Bliss, Tex. February 25-27. Classified meeting will deal with the simulation of missile environments, including such facts as temperature, pressure, radiation and shock and vibration.

(Details from Dr. W.W. Nutch, Naval Research Laboratory, Washington 25, D.C.)

PROJECT PLOWSHARE: The Bureau of Mines is asking the Nation's petroleum and chemical industries whether they would be willing to pay half the cost of a nuclear underground explosion designed to recover oil from shale. Similar proposals received a cool reception when presented to industry representatives meeting at Dallas, Tex. last month.

Mines Director Marling J. Ankeny estimates the experiment will cost about \$2½ million. He asks industry for a formal expression of their views on a full-scale test and on suggestions that a small thermal recovery program come first.

(Details from Information Service, Bureau of Mines, Washington 25, D.C. ASK for P.N. 51514-1.)

PENTAGON REGULATIONS ALTERED

Military procurement officials are up in arms over the question of quality. Two new regulations set up standards for quality of personnel assigned to technical services for ground support equipment and for quality control inspection of complex equipment and components.

Ground Support Equipment -- Air Force says that from now on contract technical services for complex ground support equipment should "normally" come from the equipment manufacturers. When permanent assignments to a particular base cannot be justified roving teams with representatives from the major manufacturer should be scheduled. And the tech representatives must be "fully qualified" on their company's products.

Procurement Inspection -- All military agencies are now required to verify systematically that manufacturers of complex equipment, components and parts exercise strict quality control. This system must extend from the production line through testing and inspection to final fabrication and delivery of products. Pentagon says that quality programs must include "the best available administrative, statistical and engineering techniques for making high-reliability weapons."

ATOMIC MERCHANT SHIPS: Maritime Administrator Clarence G. Morse has gone over the head of the Budget Bureau and is appealing directly to Congress for funds and authority to begin work on a nuclear-propelled tanker. His firm support for such a plan flies in the face of Atomic Energy Commission and Commerce Department vetoes based on the need to "balance the budget."

The Nuclear Ship Savannah, now under construction, is expected to be ready for initial test and operation in the Spring of 1960. However, Morse insists that "it cannot answer the specific economic questions raised by builders and operators of tankers, ore carriers, large passenger ships." The Savannah, he points out, was not designed to be competitive, either in construction or operation.

Why a Tanker? In 1956 work was begun to determine the ship-reactor combination which has the highest potential of achieving early economic operation. Morse says these studies show that a large tanker powered by a boiling water reactor would best meet this requirement. A tanker spends about 85 percent of its time at sea as compared to 50 or 60 percent for a cargo ship. The trend toward larger and faster super-tankers, according to Morse, also places nuclear propulsion in a more favorable position "due to the disproportionately low extra cost needed to obtain higher power."

Boiling Water Reactor: The Maritime Administrator believes that the boiling water reactor system appears to be more compact and lighter than the pressurized water type used in the Savannah. Its capacity in regard to rate of load change is viewed as suitable to maneuvering requirements, and Morse points out that a boiling water system is almost self-regulating and does not require an elaborate control system.

(Papers presented at the 1958 Nuclear Merchant Ship Symposium in Washington are now available. Write OTS, U.S. Department of Commerce, Washington 25, D.C. for TID 7563. \$4.50)

RESEARCH CHECKLIST

() RESISTOR NOISE RESEARCH: Studies for the Department of the Navy have led to development of a proposed standard test set for the measurement and evaluation of the current noise quality of fixed resistors. The equipment, developed at the National Bureau of Standards, indicates an index for current noise, called conversion gain. The noise test set consists principally of modified, readily available laboratory measuring equipment, which can be conveniently assembled and operated on a small desk top. Six such sets have been delivered.

(Details available free. Write National Bureau of Standards, Office of Technical Information, Washington 25, D.C. for Summary Tech. Report No. 2311.)

() MISSILE SCORING DEVICE: Technicians at the Air Proving Ground Center (APGC), Eglin Air Force Base, Florida, have devised a "proximity scorer" which electronically tells a pilot just how close his missiles are coming to a target. The 8½ pound unit is mounted in either towed or free-flying targets and emits electromagnetic radiations. When the missile passes near the target, these radiations are reflected, triggering a relay that transmits the missile's miss-distance to the pilot, the target aircraft, or ground observers. A full-scale "proof test" program is now underway.

() SYNTHETIC LUBRICANT OIL: Research by the Air Force and Celanese Corp. has resulted in development of a new high temperature synthetic lubricant oil for jet engines capable of withstanding temperatures of 400°F. for sustained periods. An ester type base fluid contains selected additives to insure maximum performance. Wright Air Development Center developed a silicon containing analogue of phenothiazine as a high temperature anti-oxidant. Present-day lubricants, said to be useful only in the 300-degree F. range, are viewed by the Air Force as one of the major obstacles in the development of supersonic high performance aircraft.

() FISH BONE DETECTOR: Studies sponsored by the Bureau of Commercial Fisheries have led to the development of an unusual automatic detector-rejector device for inspection of bone-bearing fish fillets. The detector system uses an x-ray image which is picked up by a special x-icon tube. The image is transmitted by wire to a receiving set where it is converted into a visual image by a special monitor. The system permits inspectors to work away from the dangers of excessive x-ray exposure. The rejection system contemplates a method of adapting a weak electrical signal sent when a bone is detected.

(Details from Information Service, Department of the Interior, Washington 25, D.C. Ask for P.N. 50338.)

() MISSILE SHELTERS: Army Engineers have adapted the principle of the flower petal in design of a weatherproof shelter to cover the lower portion of the Jupiter IRBM. Twelve 30-foot aluminum panels which are shaped like the petals of a flower close to create a water-tight seal which protects instruments and equipment until the rocket is ready to be fired. Interior of the shelter is coated with paint said to be capable of withstanding temperatures of over 1,000°F.

() HYDROFOIL RESEARCH: Maritime Administration has awarded Grumman Aircraft a \$248,528 contract for design of a high-speed hydrofoil sea craft to serve as a test vehicle in the 80-knot range. An initial study indicates such craft can operate at more than three times the speed of conventional vessels while maintaining the same ratio of payload to gross weight. General design studies will cover two theoretical craft, one of them suitable for nuclear propulsion. A test vehicle will be between 50 and 100 tons displacement, as determined by the availability of existing off-the-shelf items of equipment such as gas turbine power plants and other hardware.

() CANCER CHEMOTHERAPY: Unusual contract arrangements, which might be of interest in other fields, are included in a \$505,000 agreement for the development, test and manufacture of possible anti-cancer compounds. The contract was reached by the Public Health Service and the Upjohn Co., Kalamazoo, Mich. Under the agreement Upjohn will be obligated to undertake production of any drugs which trials indicate may be of real value in treating cancer. The policy permits a contractor to patent and sell drugs or other chemical agents developed under contract with the Government. If a manufacturer fails to supply adequate quantities to meet the public need, the Public Health Service may license other firms to produce the drug.

() HEATING-AIR CONDITIONING: Development of special heating and air-conditioning units for mobile missile control vans is being conducted at the Army Research and Development Laboratories, Ft. Belvoir, Va. Specifications call for units which are lightweight, rugged and capable of meeting exacting temperature demands. Heaters are designed for use in temperatures as low as -65°. The air conditioners are being designed for use in temperatures up to 125°. The laboratories are currently testing a 60,000 BTU per hour, electric motor driven air conditioning unit for use with anti-aircraft and Nike systems. All condenser coils in these and other units are air-cooled and use Freon 12 as the refrigerant.

() HONEYCOMB CONSTRUCTION RESEARCH: Studies for the U.S. Air Force at the Martin Co. have led to development of a brazed honeycomb sandwich construction said to withstand operational temperatures up to 1200°F. The material was developed for use in aircraft and missile structures where thermal insulation is required, such as in control surfaces, leading edges, wing skins and stabilizers.

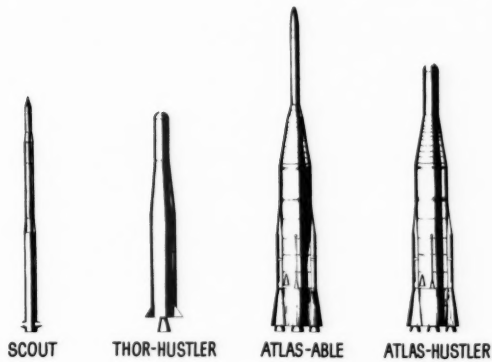
(Report available. Write OTS, U. S. Department of Commerce, Washington, 25, D.C. for PB 151 272. 105 pages. \$2.50.)

() AVIATION RESEARCH: Federal Aviation Agency has awarded Cubic Corp., San Diego, Calif., a \$721,000 contract for a MOPTAR (Multi-Object Phase Tracking and Ranging) system for installation at its new National Aviation Facilities Experimental Center. Although the system was developed primarily for missile programs it will be used by FAA for high accuracy tracking of test aircraft, and for determination of their space position. According to the agency, the MOPTAR will track five aircraft simultaneously with an accuracy rated at plus or minus 5 feet at 200 miles.

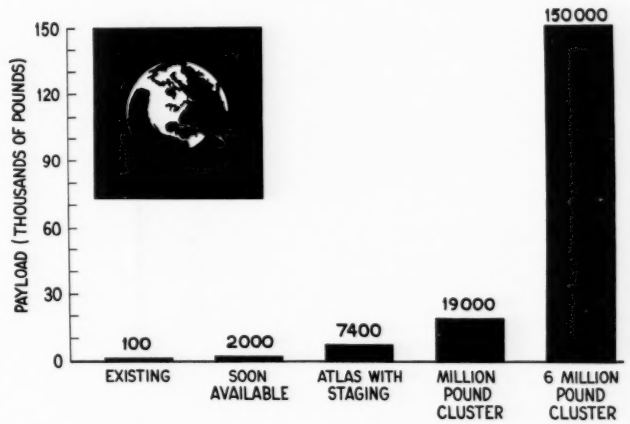
PUBLICATION CHECKLIST

- () Electronics, a newly-published section of the U.S. Navy Bureau of Ships manual designed to provide the major policies and instructions pertaining to proper handling of electronic work and materiel. 42 pages. 25 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Publication No. D 211.7 67/958.)
- () Synchros, a Navy publication on electromagnetic devices which are used for the transfer of angular-position data. Although written primarily to describe military synchros and synchro systems, most of the information is said to apply to equivalent commercial devices. 104 pages. 70 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Publication No. D 215.9:1303)
- () Uranium, a study of the origin, chemistry and enrichment of uranium in phosphorous-bearing sedimentary deposits. Issued by the Department of Interior. 45 pages. 60 cents. (Write Government Printing Office, Superintendent of Documents, Washington 25, D.C. for Publication No. I 19.16:314-D)
- () Patents, a Congressional study on renewal fees and other patent fees in foreign countries. 40 pages. 15 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Publication No. Y 4.J 89/2:P27/3 No. 17)
- () Vortac, a compilation of speeches, technical presentations and other papers presented at an international symposium last year on the U.S. short distance navigation system and its relationship to international air navigation. 212 pages. 55 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Publication No. Y 3 Ai 7/3:2 N22)
- () Military Glossary, a compilation of terms and definitions aimed at standardizing terms used by the military services and the NATO nations. Free. (Write Industrial Branch, Office of Information Service, Department of the Air Force, Washington 25, D.C. for Air Force Manual 11-1)
- () Space Law, a symposium sponsored by the Judge Advocate General of the U.S. Navy on the problems of Space Law. Includes articles by Government officials on "Space Defense" and the law which set up the National Aeronautics and Space Administration. 25 cents. (Write, Superintendent of Documents, Government Printing Office, Washington 25, D.C. for JAG Journal, February Issue)
- () Atomic Energy Commission, the semiannual report covering atomic industrial progress from July - December, 1958 and the Second World Conference on Peaceful Uses of Atomic Energy at Geneva, Switzerland. 386 pages. \$1.25. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for AEC Twenty-Fifth Report)
- () Saline Water Conversion, a survey report by a special management team on the organization and procedures of the Government's water conversion project. Free. (Write Office of Saline Water, Department of the Interior, Washington 25, D.C.)

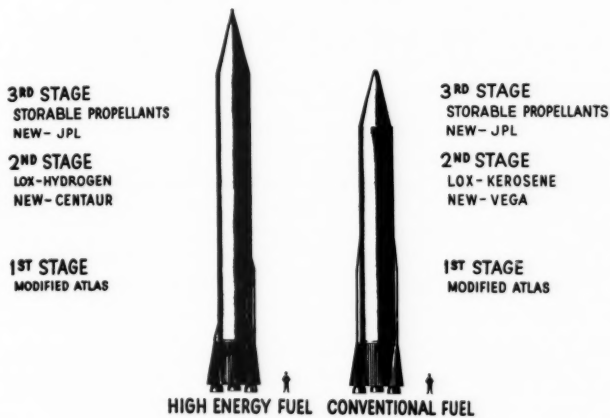
VEHICLES SOON AVAILABLE



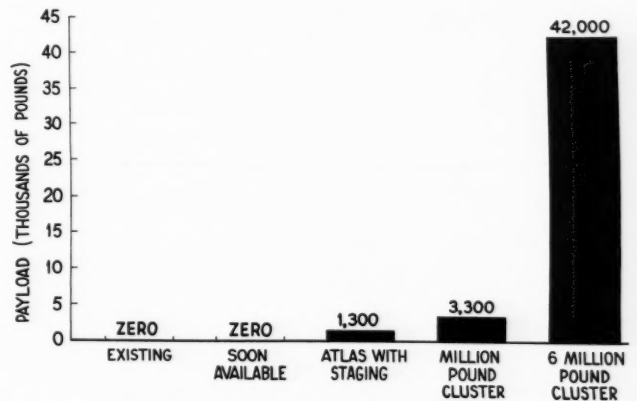
PAYLOAD GROWTH FOR 300 MILE ORBIT



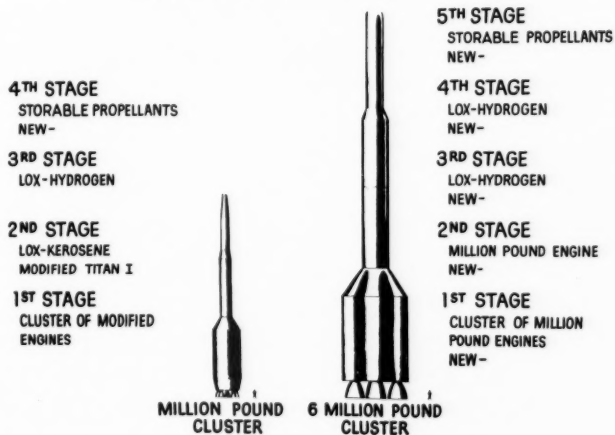
ADVANCED BOOSTERS



PAYLOAD GROWTH FOR 22,000 MILE ORBIT



ADVANCED BOOSTERS



NEW ENGINE DEVELOPMENT

THRUST PROPELLANT

6000 LB. STORABLE

15,000 LBS. LOX-HYDROGEN

20,000 LBS.

STORABLE

80,000 LBS.

LOX-HYDROGEN

1,500,000 LBS.

LOX-KEROSENE

CALENDAR YEARS

